MEMORANDUM

To: Spokane, Washington Department of Transportation

From: Nelson\Nygaard

Date: January 22, 2019

Subject: Cycle Track Case Study Review

This memorandum provides a look book of case studies that showcases the successful applications for improving downtown multi-modal connectivity using protected bicycle lanes in context-sensitive locations. These case studies were selected to provide Spokane with best practices within the frame of maintenance, design, and effect on local businesses for consideration during the development of cycle track facilities.

Figure 1 below provides a summary of the four concepts reviewed in this process, and lists all case studies featured in this memorandum. Each concept identifies several case studies. The formatted studies briefly define the example, summarize the applications, and note key takeaway for consideration.

Figure 1 Featured Case Studies

Concept	Project Type	Case Study	City	State	Year
Specialized Maintenance for Extreme Weather Conditions	Programming	Snow Removal in Bicycle Lanes	Salt Lake City	UT	Ongoing
	Programming	Snow Removal in Bicycle Lanes	Minneapolis	MI	Ongoing
	Programming	Snow Removal in Bicycle Lanes	Washington	D.C.	Ongoing
Design Variables Influencing Project Success	Protected Bikeway	E Grand Avenue	Des Moines	IA	2015
	Protected Bikeway	2nd Avenue	Seattle	WA	2018
	User Study	Pedestrian and Bicyclist Preferences for Tree Locations	Boston	MA	2018
Impact to Local Business Economics	Protected Bikeway	300 South (Broadway)	Salt Lake City	UT	2015
	Protected Bikeway	Telegraph Avenue	Oakland	CA	2016
	Economic Study	The Economic Benefits of Sustainable Streets & Protected Bicycle Lane Analysis	New York	NY	2013/4
Decision-Making Practices	Pilot Project	Centre City Cycle Track	Calgary	AB	2015
	Pilot Project	9th Avenue Protected Bicycle Lane	New York	NY	2007
	Demonstration Project	Connect the Crescent	New Orleans	LA	2018

SPECIALIZED MAINTENANCE FOR EXTREME WEATHER CONDITIONS

The following three case studies highlight how communities maintain and utilize protected bicycle lanes despite extreme weather conditions such as freezing and heavy snow. They exemplify best practices for investing in the maintenance of transportation facilities.

Programming:

Snow Removal in Bicycle Lanes: Salt Lake City, Utah (Ongoing)

Figure 2 Bicycle Facilities after Snowfall in Salt Lake City

Source: People for Bikes

What is it?

Salt Lake City, Utah holds high standards for resolving snow and ice events within the City and ensures accessibility to safe transportation through their Snow Program.

Application

Within the last decade, Salt Lake City Utah has made investments in becoming a more bicycle friendly city, with support from the City's citizen-based bicycle advisory committee.[1] By building-out a connective network of multi-use trails and protected bicycle lanes, the City has seen measurable improvements in the culture surrounding active transportation.[2]

The 2015 Pedestrian and Bicycle Master Plan outlined objectives toward maintaining the active transportation network year round, including:

- Create a snowplow team for plowing the bicycle lane network with appropriate equipment at the same time as car lanes are plowed.[1]
- As needed, increase sweeping frequency and effectiveness for on-street facilities and multi-use paths.[4]

[1] Salt Lake City Division of Transportation (2015). Pedestrian and Bicycle Master Plan. Retrieved from: https://www.slc.gov/transportation/bike/pbmp/

[2] Salt Lake City Division of Transportation (2015) 300 South Progress Report. Retrieved from: https://drive.google.com/file/d/0B8tOk7_upXv5djhCajg1Z0I3bmhTVTIxWldwRzA0YjJWNW9R/view

[4] Salt Lake City Division of Transportation (2015). Pedestrian and Bicycle Master Plan. Retrieved from: https://www.slc.gov/transportation/bike/pbmp/

- Consider maintenance needs during design of protected bicycle lanes to ensure that they can be maintained properly after construction.[1]

The public Services Streets Division in Salt Lake City commits itself to resolving snow and ice events within a 36-hour time period after a snow event,[5] and performs snow and ice control for city bicycle lanes and protected bicycle lanes[6] as directed by the Snow Program. Salt Lake City purchased specialty equipment to sweep and plow the protected bicycle lanes. This equipment is also utilized to clear other bicycle facilities and sidewalks.[7]

Takeaways for Salt Lake City:

- Coordination among existing City departments, such as Street Services, to initiate Active Transportation priorities has proved successful.
- Multi-functional equipment purchased for clearing bikeways of snow and ice also clear sidewalks, a utilization beneficial during civic or private events in the colder months of the year. Alternatively, existing equipment on-hand for clearing sidewalks may also clear protected bikeways, given adequate space in the bikeway to accommodate machinery.

Snow Removal in Bicycle Lanes: Minneapolis, MN (Ongoing)

What is it?

Minneapolis, Minnesota has over 220 miles of bikeways, including protected bicycle lanes. Winter maintenance responsibilities are assigned to the jurisdictional owner of the facility, which expand beyond the City and include the Minneapolis Park and Recreation Board (MPRB), the Minnesota Department of Transportation (MnDOT), Hennepin County, Three Rivers Park District, and the University of Minnesota. [8]

Application

The Department of Public Works holds all jurisdictions within the City accountable for achieving level of service goals of plowing or treating roadway facilities within 24 hours following a snow event. On-street bicycle facilities are cleared in conjunction with the roadway facility, while special equipment and crews focus on separated bicycle facilities.

Because six agencies split the responsibilities of maintaining the roadway within Minneapolis, they developed a collaborative trade system that eliminates redundant work orders, contracts and processes. The practice involves entering into contractual agreements to trade service management for money. For example, Agency A hires a contractor B to service the roads in their jurisdiction, as well as the roads in Agency C's jurisdiction. In response, Agency C financially compensates Agency A.

The City enacts a prioritization schedule for clearing regular roadway facilities by assigning Emergency Routes. The City may enact a "Snow Emergency" in which parking restrictions take effect and snow plows clear Emergency Routes. A similar approach is utilized in the City's 2018

[5] Salt Lake City. Snow Removal. Retrieved from: https://www.slc.gov/mystreet/snow-removal/

[6] Salt Lake City. Snow Removal Information & Facts. Retrieved from: https://www.slc.gov/mystreet/snow-removal-information-facts/

[7] Hutcheson, Robin. (October 12, 2015) Salt Lake's Protected Bike Lanes Already Seeing Big Increase in Bike Ridership. Retrieved from: https://www.deseretnews.com/article/865638874/Salt-Lakes-protected-bike-lanes-already-seeing-big-increase-in-bike-ridership.html

[8] Toole Design Group. (2018). Pedestrian and Bicycle Winter Maintenance Study. Retrieved from: http://www.minneapolismn.gov/www/groups/public/@publicworks/documents/webcontent/wcmsp-210946.pdf

Pedestrian and Bicycle Winter Maintenance Study by setting a prioritization schedule for protected bicycle lanes, shared use paths and off-street trails. This prioritization approach ensures a functional network year-round, sets resident understanding of snow and ice removal on bicycle facilities, and reflects the commitment to convenient walking and bicycling options in Minneapolis.

The following criteria, recommended by The City of Minneapolis Bicycle Advisory Committee, were identified to support a prioritization schedule:

- Connectivity with other priority routes.[8]
- Spacing between priority routes.[8]
- Estimated existing bicycle volumes.[8]
- Facility type (e.g., buffered bicycle lane, bicycle boulevard, standard bicycle lanes).[8]
- Connectivity to destinations and commercial corridors.[8]

The Minneapolis Public Works Transportation Maintenance and Repair Division provides average bikeway maintenance unit costs of protected bikeways, shown below in Figure 3. These figures provide a cost benefit comparison of one-way verses two-way facilities for consideration in future bikeway planning.

Figure 3 Minneapolis Average Bikeway Maintenance Unit Costs

Bicycle Facility Type	Maintenance Practice	Annual Cost per Linear Foot
One-way protected bicycle lane (per direction)	Remove Snow & Sweep Weekly	$6.50
Two-way protected bicycle lane on one side	Remove Snow & Sweep Weekly	$10.00

Source: Protected Bikeway Update to the Minneapolis Bicycle Master Plan

Takeaways for Minneapolis:

- Shared responsibility of bikeway street maintenance relieves individual City agencies and may promote shared sense of value in public streets and services.
- Bikeway clearing prioritization schedule for winter weather promotes frequently used routes and supports year-round ridership.
- In terms of snow/ice removal and maintenance, two-way protected bikeway condensed on one side of the street yield higher economic efficiencies than protected bikeways split by direction.

Snow Removal in Bicycle Lanes: Washington, D.C. (2014)

Figure 4 D.C. Representatives Discuss Newly Purchased Snow Removal Equipment

Source: Washington's Top News

What is it?

Washington, D.C. is taking steps toward prioritizing snow removal in protected bicycle lanes, while benefitting other modes of access for consistency with the Americans with Disabilities Act (ADA), through a new "non-motorized trail" work detail released fall 2018.

Application

In response to the 2017-2018 snow season in Washington, D.C., DC's Snow Team announced efforts to strengthen operations for the 2018-2019 season.[11]

Those efforts included purchase of a Ventrac LB 540 Power Snow Broom, effective for clearing bicycle lanes, other non-motorized trails and ADA ramps at intersections, thanks to the machinery's angle-adjustable broom head. Additionally, teams within DC's District Snow Team now focus on deployment of the equipment on non-motorized surfaces.[12] District operations continue to plow bicycle lanes only after clearing general vehicle travel lanes, as clearing general traffic lanes results in snow being stored on bicycle lanes.

[11] Government of the District of Columbia. (November 16, 2018) The District Snow Removal Operations Plan for Winter 2018-2019 and b22-752 the "Warnings Before Citations Amendment Act of 2018". Retrieved from: https://snow.dc.gov/sites/default/files/dc/sites/snow/release_content/attachments/2018%20Snow%20Hearing%20Testimony.pdf

[12] The Wash Cycle, DC. (November 27, 2018). DC Announces Special Crews to Clear Snow from Bike Lanes. Retrieved from: https://www.thewashcycle.com/2018/11/dc-announces-special-crews-to-clear-snow-from-bike-lanes.html

The District Department of Transportation (DDOT) has incorporated social media into public service requests, directing residents to the Twitter platform and hashtag #snowonbikelane to capture the attention of snow teams to where there is needed attention.[13] Residents are able to use 311, phone, online requests, and a mobile app to submit service requests, but the incorporation of Twitter is a handy response utilizing emerging technology options..

Takeaways for Washington:

- The District strengthened efforts in supporting multi-modal transportation during snow season by announcing the priority as an emergency response to worsening winter weather.
- The District considered multi-modal applications when selecting snow-clearing equipment, which now serve both bicycle lanes and other non-motorized needs.
- The District incorporated existing resident habits into government work order, by creating the hashtag #snowonbikelane and using Twitter to direct staff attention to areas where action is needed.

DESIGN VARIABLES INFLUENCING PROJECT SUCCESS

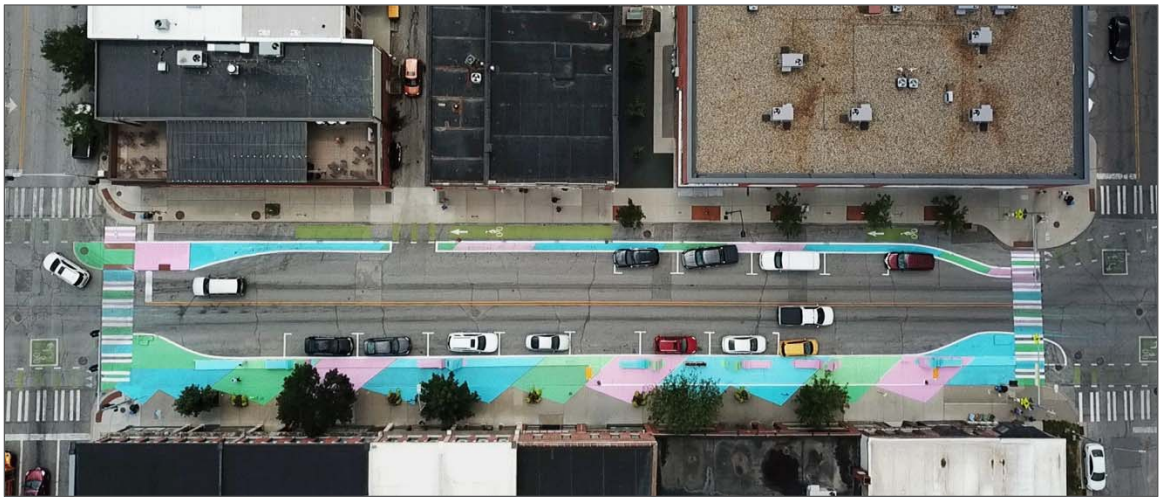
The following case studies cover implementation and user perception of currently acclaimed bikeway designs recommended by the National Association of City Transportation Officials (NACTO). These examples provide a real-world backdrop of innovative and modern technical design to consider in the context of Spokane, Washington.

[13] District Department of Transportation. Clearing Snow from Bike Lanes. Retrieved from: https://ddot.dc.gov/page/clearing-snow-bike-lanes

Protected Bikeway:

Streetscape Redesign Pilot Project and Community Engagement: E Grand Avenue, Des Moines, IA (2015)

Figure 5 Des Moines' Protected Bike Lane with New Coats of Colorful Paint



Source: Team Better Block

What is it?

The reconfiguration of E Grand Avenue in Des Moines, Iowa, was the first protected bicycle lane within the City. The pilot project, installed in fall 2017, included innovative design features involving intersection markings, lane reconfigurations and others. Before the end of the pilot year, the community's enthusiasm and support for the project led to new partnerships and grant awards which funded additions to the bicycle lane, such as colorful paint, street furniture and potted plants.

Figure 6 E Grand Avenue in Original Pilot, Design and Project Delivery

Source: Team Better Block

Application

Implementation of the road reconfiguration on E Grand Avenue was driven by community feedback on dangerous intersections for pedestrians.[14] By redesigning the street for slower motor-vehicle speeds, residents and business owners alike benefit from improved ease of pedestrian crossings, fostering travel between retail stores and restaurants along the corridor.

[14] Salonikas, Christina. (March 20, 2018). Tweaks Made to East Grand Protected Bike Lane Pilot Project. Retrieved from: https://whotv.com/2018/03/20/tweaks-made-to-east-grand-protected-bike-lane-pilot-project/

Notable design features in addition to the protected bicycle lane and narrower traffic lanes include shorter pedestrian crossings across E Grand, placement of transit stops in the travel lane to minimize delay to transit buses, and improved sight lines of pedestrians and bicyclists by relocating parking to adjacent corridors[15]. In spring 2018, minor changes to the placement of plastic delineators were made, including reduced distance from the curb and removal of delineators near intersections to accommodate larger vehicles turning.[14]

The City, the Greater Des Moines Partnership, business owners and local advocates supported the project further by teaming with the American Association of Retired Persons and Team Better Block to create the summer 2018 East Grand Avenue Better Block Project. The complimentary project re-painted the protected bicycle lane, installed street furniture and built larger delineators, all in vibrant and exciting colors.[16]

Figure 7 Vibrant and Interactive Street for All Users

Source: Team Better Block

Takeaways for Des Moines:

- Project support driven by local business-owners after education on the revenue increase effects of bicycle infrastructure.[18]
- Application of latest standards in bikeway design largely successful, with only minor changes needed to accommodate larger sized vehicles as necessary.
- Providing the community its first experience of a protected bikeway street re-design inspired new partnerships to form. Those organized groups won grant funding and successfully re-invigorated the pilot project into a safe and interactive work-of-art.

[15] City of Des Moines Engineering Department. (September 29, 2017). East Grad Avenue Complete Street Pilot Project. Retrieved from: https://projects.dmgov.org/system/resources/W1siZiIsIjIwMTcvMDkvMjkvOGU3bjJwbmVmOV9FX0dyYW5kX1BpbG90X1VwZGF0ZS5wZGYiXV0/E%20Grand%20Pilot%20Update.pdf

[16] Team Better Block. (2018). East Grand Better Block. Retrieved from: https://teambetterblock.com/east-grand

[18] Andersen, Michael. (December 6, 2017) Why Business is Leading the Charge for Des Moines' $33M Street Overhaul. Retrieved from: https://peopleforbikes.org/author/michaelpeopleforbikes-org/page/3/

Mobility Improvements for All Ages & Abilities: 2nd Avenue, Seattle, WA (2018)

Figure 8 Seattle 2nd Street in Downtown

Source: The Urbanist

What is it?

Seattle, Washington opened a protected bicycle lane along 2nd Avenue from Denny Way to Pike street in late winter of 2018. The project transformed a one-way (plastic delineated) protected left-side bicycle lane on a one-way street, into a two-way cycle track with planted, 3-foot concrete buffers.

Figure 9 2nd Street Before and After Sections

Source: Seattle DOT Blog

Application

Placement of the bicycle lane on the left side of the street is great on one-way roads due to reduced conflicts with transit vehicles on the right. Left side placement also opens opportunity to connect with other bicycle facilities[19], improves bicyclist visibility, and reduces conflicts with trucks. Relatedly, goods and motor vehicles move through the street more efficiently.[21]

[19] NACTO. Left Side Bike Lanes. Retrieved from: https://nacto.org/publication/urban-bikeway-design-guide/bike-lanes/left-side-bike-lanes/

[21] Seattle Department of Transportation. (Fall 2016). 2nd Ave Mobility improvements: Retrieved from: https://www.seattle.gov/Documents/Departments/SDOT/BikeProgram/2ndAveMobility_FactSheet_Dec2016.pdf

On Seattle's protected bicycle lane along 2nd Avenue, the leftmost vehicle lane was altered to parking spaces and left-turn lanes at appropriate intersections. The new parking protects bicyclists and pedestrians from moving traffic through increased distance and a physical barrier. New left-turn lanes separate turning vehicles from the thru-lane, which promotes the flow of thru-traffic and reduces any weaving by vehicles attempting to pass on the right. These new left-turn lanes also incorporate controlled signal phasing, safely allowing pedestrians and bicyclists the freedom to pass through the intersection while vehicles wait at red turn arrows.**Takeaways for Seattle:**

- The two-way left-side cycle track serves bicyclists in both directions while improving traffic flow of busses and goods.
- Removing one lane of traffic provided parking and protected left turn lanes, which prioritize the safety of pedestrians and bicyclists through the intersection while improving traffic flow of throughput vehicles.
- During the construction, the Seattle Department of Transportation capitalized on equipment in the field by repairing sidewalk spots within the corridor.[21]

User Study:

Photomontage-based User Survey: Pedestrian and Bicyclist Preferences for Tree Locations with Cycle Tracks, Boston, MA (2108)

Figure 10 Sample of Images Presented in User Preference Study

Source: Pedestrian and cyclist preferences for tree locations by sidewalks and cycle tracks and associated benefits: Worldwide implications from a study in Boston, MA

What is it?

Academics of Harvard T. H. Chan School of Public Health and Universidade de São Paulo School of Agriculture performed a pedestrian and bicyclist user-preference study on variable preferences of tree locations in cycle tracks. [23]

Application

The study, *Pedestrian and cyclist preferences for tree locations by sidewalks and cycle tracks and associated benefits: Worldwide implications from a study in Boston, MA*, provided participants with photomontages of five cycle tracks in the Boston area. Those included: 1) no trees; 2) trees between the sidewalk and the cycle track; 3) trees between the cycle track and the street; 4) trees with bushes between the cycle track and the street, and, on one street; 5) trees in the street between the parallel-parked cars[23]. Participants responded to the images using a

[23] Lusk, Anne C., Ferreira da Silva Filho, D., Dobbert, L. (June 24, 2018). Pedestrian and Cyclist Preferences for Tree Locations by Sidewalks and Cycle Tracks and Associated Benefits. Retrieved from: https://www.sciencedirect.com/science/article/pii/S026427511731329X

preference scale (Strongly dislike/disagree = 1, Strongly like/agree = 7) that informed study results.

Cities traditionally plant street trees in the sidewalk adjacent to the roadside (the standard). Study results show both pedestrians and bicyclists prefer trees and trees with bushes placed between the cycle track and the street compared to the standard.. Planted buffer designs evoke participant perceptions of less exposure to air pollution and less exposure to traffic.[23]

Takeaways for Boston:

- Both pedestrians and bicyclists preferred trees and trees with bushes planted between the cycle track and the street, in comparison to the common practice of planting landscaping in the sidewalk between the pedestrians and the bikeway.
- Engineers and planners can consider the cycle track buffer as a landscaping opportunity with extensive benefits on the user experience.
- The planted buffer design evoked participant perceptions of lessened exposure to air pollution in addition to lessened feelings of exposure to traffic.[23]

IMPACT TO LOCAL BUSINESSES ECONOMICS

Not all business communities are immediately eager to adopt unfamiliar cycle track infrastructure on the streets outside their doors. These examples provide varying frameworks on how and why businesses welcomed, and even became rallying supporters of, innovative bikeway designs.

Protected Bikeway:

Business Sales Increase: 300 South (Broadway), Salt Lake City, Utah (2015)

Figure 11 Intersection of 300 South and 200 West

Source: People for Bikes

What is it?

In 2014, Salt Lake City, Utah built a protected bicycle lane on 300 South (Broadway) in support of providing accessibility for residents of all ages, and improving the City's livability, sustainability,

air quality, economy, and public health.[24] The City followed-up by performing an impact study on economic development, among other variables, in relation to the completed project.

Application

Design features of the re-designed streetscape included street planters, public art, improved pedestrian crossings, colored pavements, a switch from diagonal to parallel parking, and concrete buffers between traffic lanes and the cycle track. [25] Over a year after the completed cycle track construction, the Salt Lake City Division of Transportation released an in-house study that measured the cycle track's effects on utility, safety, public sentiment, and economic development.

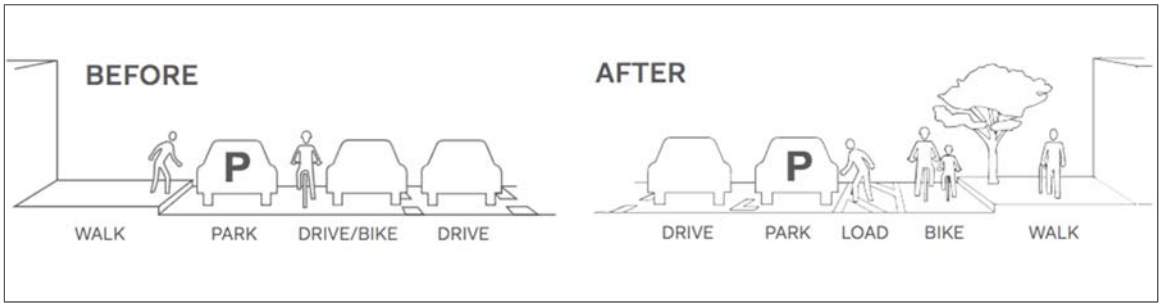
Using data from businesses along the corridor collected from Utah State Tax Commission, records proved that Sales Tax Gross Receipts increased by 8.79%, when comparing the first six months of the year between 2013 (pre-project) and 2015 (post-project). The study also collected anecdotal evidence of the economic impact through surveying retail, restaurant, and service businesses. The majority of respondents (79%) reported business was good. Less so, 16% reported business was better than before, and a minority (4%) reported business was down.

Takeaways for Salt Lake City:

- Quantitative data indicated increased in Sales Tax Gross Receipts between pre-cycle track and post-cycle track years.
- Qualitative data indicated the vast majority (79%) of businesses claimed business was good, 16% claimed it was better than before, and 4% claimed it was down.

Noteworthy Bicycle Lane of the Year: Telegraph Avenue, Oakland, CA (2016)

Figure 12 Before and After Street Sections of Telegraph Avenue



Source: Oakland DOT

What is it?

The City of Oakland, California's Department of Transportation built a parking-protected cycle track on Telegraph Avenue, one of the City's most dangerous streets for all vehicle-involved collisions. What was before a roadway with five travel lanes and parking in both directions, the re-designed street now includes a median with turn lanes, and in each direction: one travel lane,

[24] Bike Salt Lake City. Transforming Downtown Streets. Retrieved from: http://www.bikeslc.com/What'sNew/TransformingDowntownStreets.html

[25] Anderson, Michael. (October 5, 2015) Salt Lake City Street Removed Parking, Adds Bike Lanes and Sales Go Up. Retrieved from: https://peopleforbikes.org/blog/salt-lake-city-street-removes-parking-adds-bike-lanes-and-sales-go-up/

parking, a passenger loading zone and a protected bicycle lane.[26] Community partner Bike East Bay, a local advocacy organization, was critical in building support from two business associations and organizing pop-up demonstration efforts.[27]

Figure 13 Telegraph Avenue Final Plan Concept Drawing and Project Delivery

Source: Oakland DOT

Application

In the inaugural year of the cycle track, the project was announced as one of People for Bikes' winners of America's Best New Bike Lanes.[27] The City of Oakland was eager to announce the positive impacts, releasing a study in early 2017 covering crashes and injuries, volumes, traffic speeds, user satisfaction, and economic vitality.[28]

Using sales tax revenue data collected from the Oakland Economic and Workforce Development Department, the study announced that while not entirely attributable to the cycle track project, evidence showed an increase in retail sales. A 9% increase in retail sales was noted in Koreatown-Northgate District adjacent to the Telegraph Cycle Track when comparing the third quarter of 2015 (pre-project) and 2016 (post-project).[28]

A performance study comparing pre-implementation data (Fall 2013) to post-implementation data (Fall 2016) showed an increase in people bicycling and walking during peak hours by 78% and 100%, respectively. Higher volumes of people on bike and foot in the corridor may be an indicator that people are enjoying walking and biking in the area, which often results in improved business sales. Additionally, five new businesses in the District opened since completion of the Telegraph Avenue Project.[28]

Takeaways for Oakland:

- Collaborating with bicycling advocacy groups builds community relationships and potential supporters of business associations.
- The Telegraph Avenue Cycle Track neighborhood was already home to bars, restaurants, and art galleries among other retail services. Cycle tracks may increase business particularly well in areas where there is existing activity on the street day and night.

[26] Curry, Melanie. (January 30, 2017) Telegraph Avenue Parking-Protected Bike Lanes Show Stunning Results. Retrieved from:https://cal.streetsblog.org/2017/01/30/telegraph-avenue-parking-protected-bike-lanes-show-stunning-results/

[27] Andersen, Michael. (December 16, 2019). America's Best New Bike Lanes of 2016. Retrieved from: https://peopleforbikes.org/blog/americas-best-new-bike-lanes-of-2016/

[28] Oakland Department of Transportation. (January 2017). Telegraph Avenue Progress Report. Retrieved from: http://www2.oaklandnet.com/oakca1/groups/pwa/documents/report/oak062598.pdf

Economics Study: Protected Bicycle Lane Analysis

Applying Standardized Metrics: The Economic Benefits of Sustainable Streets, NYC Dept. of Transportation, New York, NY (2013/2014)

What is it?

In 2013, the New York City Department of Transportation (NYCDOT), New York, released *The Economic Benefits of Sustainable Streets*. It contained a robust set of metrics to evaluate the outcomes of street projects with respect to the agency's goals. That methodology, detailed below, supported a *Protected Bike Lane Analysis*, a comprehensive study on safety, mobility, quality of life, and economic vitality along cycle track corridors as a follow-up to installing over 30 miles of protected cycle tracks within the City from the year 2007.

Application

The Department's methodology used reported sales for street-level retail and restaurant food service business, and filtered for relevant data in terms of industry category and physical storefront location. The methodology measured changes in business within a project area before and after implementation, and then compared to control site data from the same collection period.[29] *Protected Bike Lane Analysis* reported measured economic impact on two cycle tracks: 9th Avenue and Columbus Avenue.

The 9th Avenue Cycle track corridor saw a 47% increase in combined sales before vs 2-year after construction. Control sites 10th Avenue and 7th Avenue yielded fewer gains, at 43% and 23% increases, respectively.[30]

The Columbus Avenue Cycle Track corridor (W 77th – W 96th Streets) saw a 20% increase in combined sales before vs 2-year after construction. Control sites Amsterdam Avenue and Columbus Avenue (16th -26th Streets) yielded fewer gains, at 12% and 9% increases, respectively.[30]

Takeaways for New York City:

- NYC DOT standardized metrics for measuring economic changes before and after project implementation. The methodology allows the department to prepare for projects, fully understand their quantitative effects, and accurately compare the benefits of two or more projects despite contextual differences.
- Economic improvements occurred along two separate corridors after the construction of protected bicycle lanes, and surpassed economic rises in comparable control sites for the same period.

DECISION-MAKING PRACTICES

Approaches to bikeway design, from planning to implementation, vary amongst communities. A common theme in successful project implementation is community empowerment. Collaborating with community organizations, bike advocacy groups, and creating opportunities for public

[29] New York City Department of Transportation. The Economic Benefits of Sustainable Streets. Retrieved from: http://www.nyc.gov/html/dot/downloads/pdf/dot-economic-benefits-of-sustainable-streets.pdf

[30] New York City Department of Transportation. (September 2014). Protected Bicycle Lanes in NYC. Retrieved from: http://www.nyc.gov/html/dot/downloads/pdf/2014-09-03-bicycle-path-data-analysis.pdf

feedback foster community support. The following case studies show successful project evolution through public engagement that ensures design matches the local context of a community.

Pilot Studies:

Continually Growing Support: Centre City Cycle Track, Calgary, AB (2015)

Figure 14 Centre City Cycle Track

Source: Lucy Ramirez and Blanka Bracic

What is it?

Calgary, Alberta, Canada opened the Centre City Cycle Track on a temporary basis in summer 2015. The City performed research from 2014 through 2016 to measure mode use, experienced and perceived safety, and project awareness, support and attitudes.[31]

Application

While pilot projects in bikeway design typically run for 12 months, Calgary's pilot project was in place for 18. The extended period allowed for project data collection at six different times during the pilot.[31] This data allowed researchers to compare pre and post project data, and collect two sets of post-project data exhibiting changes as the community became more accustomed to the facilities. Public input between 2014 and 2016 informed design changes to the pilot, which among others increased ridership and responses toward safety.

The project team paid close attention to the cycle track's compatibility with Calgarians, and monitored community feedback to inform over 100 successful adjustments to the design.

Education played a key role in the pilot's success. By prioritizing information distribution and outreach, the project team built safe and fun cycling into Calgary's transportation culture. Key strategies included:

- Newsletters, Cycling Guides and stickers for community giveaways.

[31] Ipsos Public Affairs. (2016) Cycle Track and Stephen Avenue Bicycle Pilot Projects Research. Retrieved from: http://www.calgary.ca/Transportation/TP/Documents/cycling/City%20Centre%20cycle%20track/cycle-track-pilot-research-final-report-nov-2016.pdf

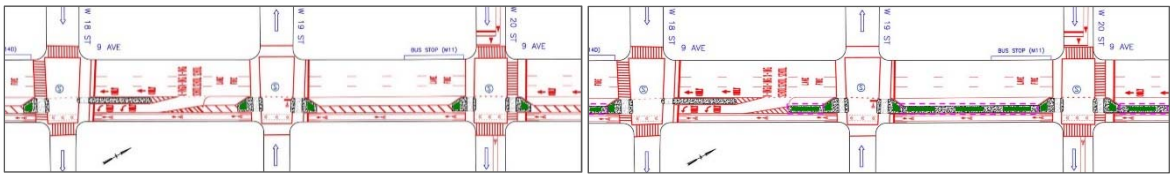
- A project website, social media influence, parking garage signage and on-street signage built regular awareness.
- The 'Thank You' campaign and the 1,000,000 cycle track trips event celebrated community members using the infrastructure.

Takeaways for Calgary:

- Three dedicated staff positions were created to "plan and design infrastructure, and educate and promote cycling,"[32] allowing for extensive project coverage and support to make the project a success.
- The Downtown Cycle Track Network Pilot Evaluation Plan[33] outlined over 80 performance measures and targets[34] before pilot construction, promoting multi-dimensional measurement opportunities.
- By responding to public feedback and implementing over 100 successful revisions, the project was able to triple ridership along the network, improve experience of the street for majority of street users (including drivers), and report a 90% safety positive response from survey participants.[31]

Prioritizing by Outcomes: 9th Avenue Protected Bicycle Lane, New York, NY (2007)

Figure 15 Pilot Concept Plan and Long Term Concept Plan



Source: NYC DOT

What is it?

The City of New York ran a pilot project on 9th Avenue in 2007 to create a safe and comfortable street for all users. NYC had been receiving positive feedback on the greenways introduced to the City and decided to expand on the positive momentum. Backed by information on successful cycle tracks in European cities, NYC made the decision to implement a blend of greenways and cycle tracks.

Application

New York City installed a 10' wide, left-side cycle track with planted protective buffers on the one-way street 9th Avenue. The pilot featured landscaping and small concrete pedestrian islands at

[32] Ramirez, L., Bracic, B. (2015) Calgary's Centre City Cycle Track Pilot Network. Retrieved from: http://janicelukes.ca/wp-content/uploads/2016/10/Calgarys-Centre-City-Cycle-Track.pdf

[33] Calgary. (2015). Evaluation Plan: Performance Measures & Targets. Retrieved from: http://www.calgary.ca/Transportation/TP/Documents/cycling/City%20Centre%20cycle%20track/downtown-cycle-track-pilot-project-evaluation-plan.pdf

[34] Calgary. Downtown Cycle Tracks. Retrieved from: http://www.calgary.ca/Transportation/TP/Pages/Cycling/Cycling-Route-Improvements/Downtown-cycle-track-pilot-project.aspx?redirect=/cycletrack&master=old

intersections. This form of build complimented the pedestrian experience by providing greenery, which would have been unachievable using the standard pilot materials of paint and plastic bollards. The long-term build-out of the project extended the planted buffers along the length of the cycle track, extending the planting area from its original focus at intersections.[35]

While the infrastructure provided bicyclists a safe and enjoyable space to ride, the City prioritized the pedestrian experience in outreach. Project presentation highlighted planting beds and green space opportunity for the pedestrian, along with shorter crossing distances of 25' less across 9th Avenue. The City also maintained open dialogue with all stakeholders from the beginning stages of the project, and performed revisions as needed, such as modified parking regulations.[36]

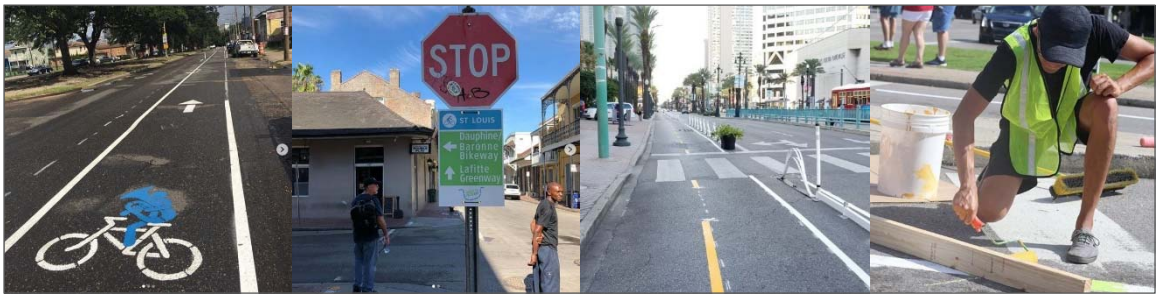
Takeaways for New York:

- New York City built permanent fixtures despite the project's pilot phase status. In doing so, properly presented the character of the project, where plastic bollards would not suffice for representation of landscaping and greenery.[35]
- The City recognized the most common users of the street and highlighted the project's benefits to pedestrians during presentation and outreach.[35]
- Concrete fixtures such as bulb-outs and planters are viable pilot project features, especially when they provide greenery and present the project's full character. Feedback from community with needed revisions can be policy based, such as modified parking policies.[36]

Demonstration Project:

3-month Pop-up Event: Connect the Crescent, New Orleans, LA (2018)

Figure 16 Temporary Materials Used in the 3 Month Pop-Up Demonstration Project



Source: Connect the Crescent

What is it?

A community organization and volunteer supported project, Connect the Crescent was an installation running September through December 2018. The project served to start community

[35] Traffic Operations Bureau. (September 19, 2017) 9th Avenue Bicycle Facility & Complete Street Design. Retrieved from: http://www.nyc.gov/html/dot/downloads/pdf/9thavecomp.pdf

[36] NACTO. 9th Avenue On-street Protected Bike Path New York, NY. Retrieved from: https://nacto.org/case-study/ninth-avenue-complete-street-new-york-city/

discussion on enhanced pedestrian and bicycle networks in New Orleans, Louisiana.[37] Rather than select a single corridor for a cycle track, the project created a whole network of protected bicycle lanes, allowing safety and accessibility to connect various areas of downtown.

Application

Connect the Crescent was a community supported demonstration program, receiving support from local residents, donors, sponsors, partners, supporters, and the Connect the Crescent Steering Committee.[37]

Advocacy group, Bike Easy, worked with the City to host two charrettes in early 2018 to identify potential project routes. The Connect the Crescent Steering Committee, formed by 16 organizations and businesses, selected a complete bicycle route network in Downtown, supported by engineering and design by the Department of Public Works.[37] Following stakeholder and door-to-door outreach throughout the month of August, over 200 volunteers came out to build the pop-up in the first week of September. Build materials consisted of painted lane markings on the street, temporary signage hung on existing infrastructure, potted plants and freestanding plastic bollards. Connect the Crescent opened to the public the following week.[37]

The bikeway demonstration filled gaps in the existing route network by installing 12 street segments connecting to existing on-street bikeways and trails. The approach opened new commute opportunities by capitalizing on existing infrastructure. The project was also an opportunity to experiment with a two-way cycle track design that was less familiar to the community. This pop-up element was built on Baronne Avenue, and connecting to existing on-street bikeways at four locations.[38]

Leading up to and for the duration of Connect the Crescent, the organizing parties hosted safety workshops, discussions on transportation needs, and welcomed the Walk/Bike/Places Conference the day after opening ceremony. Evaluation of the project began opening day and continued through the demonstration. The “Transportation Survey” and website contact page were two methods of connecting to the project team, while the City set up an email exclusively to receive project feedback from residents.

Takeaways for New Orleans:

- Bike advocacy groups and local community organizations are potential partners to create, develop, organize, and build fun demonstration events that show communities the potential of their streets.
- New classes of bikeway infrastructure pair well with familiar design. By incorporating innovative designs into a complete network including on-street bikeways, communities benefit from experiencing the safety and comfort of protected cycle tracks and how they contribute to the existing network.
- Pop-up events are an opportunity to present robust network connectivity to the community. By installing temporary bikeways on twelve various streets, the project reached more residents and provided enjoyable transportation options to a greater array of destinations than a pilot reserved to one corridor.

[37] Connect the Crescent. What is Connect the Crescent? Retrieved from: https://connectthecrescent.com/about/

[38] Connect the Crescent. Safer Walking, Improved Transit, Protected Bikeways. Retrieved from: https://connectthecrescent.com/

One-Way Cycle Track Connectivity

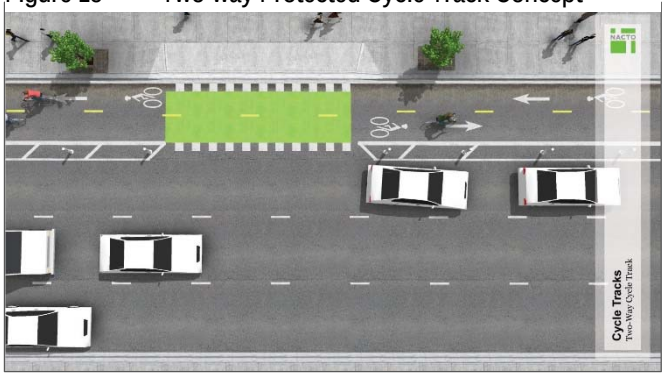
Figure 17 Cycle Track Connectivity

Case Study	Street	Feature Type	Distance from Opposite Direction/Nearest Other Facility	Opposite Direction/Nearest Other Feature Type
Salt Lake City, Utah	200 W	Two-way protected cycle track on two-way street	1,500 feet (Main Street)	Two-way on-street bicycle lanes on two-way street
Minneapolis, Minnesota	Portland Avenue	One-way buffered bicycle lane on one-way street	1,650 (Park Ave)	One-way buffered bicycle lane on one-way street
Washington, D.C.	M Street NW	One-way protected cycle track on one-way street	700 feet (L Street NW)	One-way protected cycle track on one-way street
Des Moines, Iowa	E Grand Avenue	Two-way protected cycle track on two-way street	800 feet (E Walnut St)	Two-way on-street bicycle lanes on two-way street
Seattle, Washington	2nd Avenue	Same side, two-way protected cycle track on one-way street	650 feet (Western Ave)	One-way protected cycle track on two-way street
Salt Lake City, Utah	300 South / Broadway	Two-way protected cycle track on two-way street	800 feet (200 S)	Two-way on-street shared lanes on two-way street
Oakland, CA	Telegraph Avenue	Two-way protected cycle track on two-way street	1,100 feet (Martin Luther King Jr Way)	Two-way on-street bicycle lanes on two-way street
Centre City, Calgary	8th Avenue	Same side, two-way protected cycle track on one-way street	1,500 feet (12th Avenue)	Same side, two-way protected cycle track on one-way street
9th Avenue, New York	9th Avenue	Two-way protected cycle track on left-side of one-way street	900 feet (8th Avenue)	One-way protected cycle track on one-way street
New Orleans, Louisiana	Barronne Street	Same side, two-way protected cycle track on one-way street	850 feet (Loyola Avenue)	Two-way on-street bicycle lanes on two-way street

One-way cycle tracks in the case studies had accompanying lanes in the opposite direction of travel within 1,650 feet. Three case studies included same side, two-way protected bicycle tracks on one-way streets.

A two-way cycle track allows for a more compact layout than two one-way cycle tracks on opposite sides of the street. It also creates a more condensed network for bicyclists, which may be functional along key corridors where many destinations may be concentrated. Additionally, they facilitate ease-of-access for the return trip from destination to origin.

Figure 18 Two-way Protected Cycle Track Concept



Source: NACTO

One-way cycle tracks may be preferred where right of way is limited. Utilizing less right of way on a set of parallel streets (to serve opposite running cycle tracks) may be easier to install from a geometric and political perspective.